In Situ Manufacturing of Plastics and Composites to Support H&R Exploration, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

Our proposed Phase I program will develop a reactor system for the synthesis of polyethylene from carbon dioxide and water. The proposed work will result in hardware capable of the in-situ fabrication of high-density polyethylene suitable for the construction of inflatable enclosures and panels, which can be used to construct extraterrestrial habitats. In-situ production of habitat structural materials would result in substantial cost savings compared with transporting the material from Earth. The system will serve as an engineering prototype for for future missions to demonstrate in-situ production of consumables. We expect that the technology to produce ethylene and polyethylene will be sufficiently mature to be considered for demonstration in the 2005 or 2007 programs. Our proposed program addresses two fundamental technology issues: (1) In Situ Synthesis of Hydrocarbon Fuels and Oxygen (2) In Situ Synthesis of Materials for Isolated Habitat Construction and Support. It addresses several key crosscut issues based on the use of In Situ Resources, e.g., - Life Support for Spacecraft Including Space Station Freedom - Life Support for Lunar and Martian Bases and Colonies - Propellants for Propulsion for Planetary Rovers and Return Vehicles.

Anticipated Benefits

Conversion of carbon oxides, carbon dioxide and carbon monoxide, to hydrocarbons, alcohols, and other value added compounds, using innovative catalytic reduction processes, will have important enabling commercial benefits. Significant near term commercial applications for small scale, integrated, autonomous reactors will enable at least four markets for in situ chemical processes, which otherwise would not be cost effective. Hydrocarbon Reformer for Fuel Cells, Natural Gas Upgrading, Green House Gases Processing, Microchannel Reactor Applications These markets include the following customers: Off-grid Data Systems, High-Income/Consumption Households Seeking Secure Backup Power, Premium Power Customers, UPS Systems, Fuel Cell Vehicles

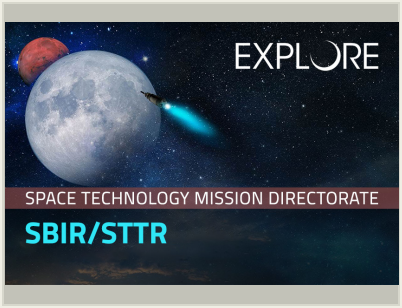

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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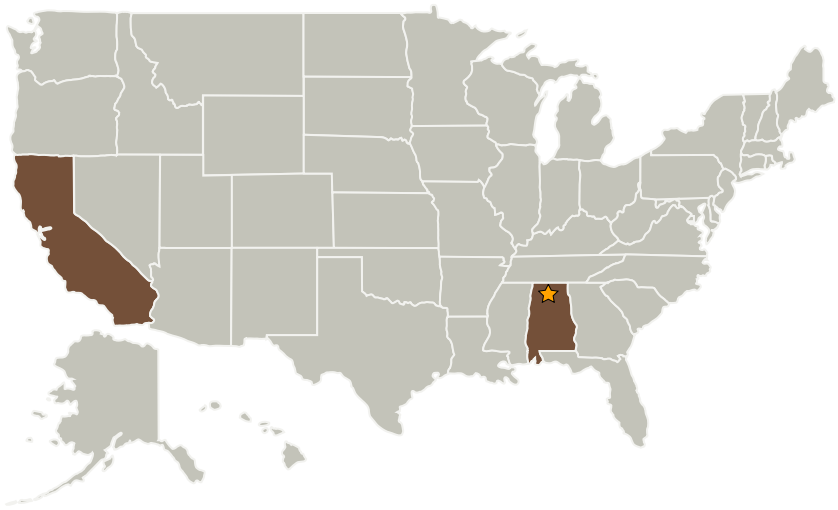
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Makel Engineering, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Chico, California

Primary U.S. Work Locations	
Alabama	California

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Kenneth G Cooper

Principal Investigator:
Darby Makel

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.3 Resource Processing for Production of Mission Consumables